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(71) Anmelder (für alle Bestimmungsstaaten ausser US): PAUL HETTICH GMBH & CO. [DE/DE]; Vahrenkampstraße 12-16, D-4983 Kirchlengern 1 (DE).

(72) Erfinder; und
(75) Erfinder/Anmelder (nur für US) : BEHRING, Reinhard [DE/DE]; Oeppingsheide 1, D-4983 Kirchlengern 4 (DE).

(74) Anwälte: STRACKE, Alexander usw. ; Jöllenbecker Straße 164, D-4800 Bielefeld 1 (DE).

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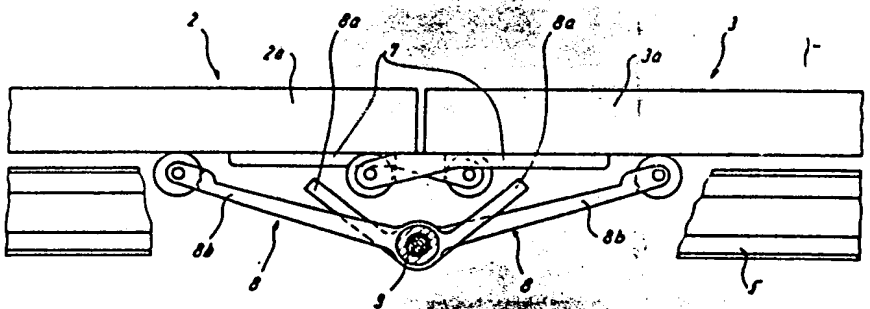
(54) Title: FOLDING DOOR WITH SEVERAL PAIRS OF PANELS

(54) Bezeichnung: FALTTÜR MIT MEHREREN FLÜGELPAAREN



(57) Abstract

The invention concerns a folding door with several pairs (2, 3) of panels and fitted with a simple, functional and space-saving device for opening out the individual pairs (2, 3) of panels. Fixed to the neighbouring panels (2a, 3a) of two pairs (2, 3) of panels are entrainment pieces (7) in whose field of traverse lie the arms (8a) of two-armed levers (8). The other arms (8b) of the levers (8) extend to the nearest respective panel (2a) and (3a) so that, when one of the panels (e.g. 2a) pivots, from a certain point in the pivoting motion a turning moment is generated which acts via the entrainment piece (7), the lever arm (8a) and the lever arm (8b) on the neighbouring panel (3a) in the opening direction.

(57) Zusammenfassung

Eine Falttür mit mehreren Flügelpaaren (2, 3) soll mit einer einfachen und funktionellen, raumsparenden Öffnungshilfe beim Auffalten der einzelnen Flügelpaare (2, 3) ausgestattet werden. Zu diesem Zweck sind an den benachbarten Flügeln (2a, 3a) zweier Flügelpaare (2, 3) Mitnehmer (7) befestigt, in deren Schwenkbereich Hebelarme (8a) von zweiarmigen Hebeln (8) liegen. Die Hebelarme (8b) der Hebel (8) erstrecken sich bis zum jeweils benachbarten Flügel (2a) und (3a), so daß ab einer bestimmten Schwenkbewegung beispielsweise des Flügels (2a) über den Mitnehmer (7), den Hebelarm (8a) und den Hebelarm (8b) auf den benachbarten Flügel (3a) ein in Öffnungsrichtung wirkendes Drehmoment ausgeübt wird.

Folding door with a plurality of leaf pairs

The present invention relates to a folding door.

Known folding doors suffer from the problem that, when leaf pairs of the folding doors are opened out from a closed position, torque must be applied to the individual leaves and this causes the leaves to move out of the closed position and buckle at the articulatation axis.

During the opening procedure, the first leaf pair, which the user intends to open, can usually have the necessary torque applied to it by way of a handgrip. As opposed to this, with the adjoining leaf pairs, this is no longer possible, so that it is desirable to have an effectual opening aid in this situation.

The present invention attempts to overcome one or more of the above problems.

According to the present invention there are provided a folding door having a plurality of leaf pairs, in which the leaves of each leaf pair are joined together in an articulated manner and each of two adjacent leaf pairs are hinged onto a common bearing device and at least the bearing device(s) is/are mounted to travel along at least one horizontal guide rail, characterised in that the folding door has, in the hinge region of two adjacent leaf pairs, at least on the leaf of one leaf pair, an entrainment means and, mounted on the common bearing device, a two-armed lever which can pivot around an axis of rotation parallel to the hinge axis, one arm of said lever being in the sweep zone of the entrainment means, with the other arm of the lever extending out across the region of the leaf which is adjacent to the leaf fitted with the entrainment means, so that, from a predetermined pivoted angle of the leaf fitted with the entrainment means onwards, a torque acting in the opening direction is

exerted, by way of the two-armed lever, on the adjacent leaf of the folding door.

A preferred embodiment of the present invention using the construction of the type described, offers a highly effectual opening aid for the folding out of successive leaf pairs, without the need for any special manipulative technique on the part of the user. In addition to this, it is a simple matter to assemble the opening aid which consists of only a few separate components and, determined by the fact that the two-armed lever can be pivoted around an axis of rotation which is parallel to the hinge axis, the opening aid is an exceptionally space-saving device, which is of great importance in the case of folding doors for cupboards.

Preferred embodiments of the present invention will now be described in greater detail, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic view of the rear side of a folding door with two leaf pairs,
Fig. 2 is an enlarged view of the encircled portion of Fig. 1 designated by II, shown partly in section,
Fig. 3 is a section along line III - III in Fig. 2,
Fig. 4 is a section corresponding to that shown in Fig. 3 with the leaf pair in a partly-opened position,
Fig. 5 is a view corresponding to Fig. 2 of an additional example of embodiment of the invention,
Fig. 6 is a section along line VI - VI in Fig. 5 with the folding door partly opened,
Fig. 7 is a part view in the direction indicated by the arrow VII in Fig. 5.

The folding door 1 depicted in Fig. 1 has two leaf pairs 2 and 3, in which case the leaves 2a and 3a of each of the leaf pairs 2 and 3 are joined together in an articulated manner by the hinges 4.

The two adjacent leaf pairs 2 and 3 are hinged onto a common bearing device 5 and this bearing device 5 is mounted in a manner known per se to travel along a horizontal guide rail 6.

In addition, the two outer members 2a and 3a of each leaf pair 2 and 3 respectively are likewise mounted to travel along the horizontal guide rail 6.

This signifies that the folding door 1 - in relation to the design shown in Fig. 1 - can be opened towards the left-hand side equally well as towards the right-hand side.

It must be pointed out at this juncture that the basic concept of the present invention does not have any fundamental connection with the fact that the folding door 1 can be opened towards both sides, or whether one or other of the end leaves 2a and 3a is mounted in a fixed position in relation to the guide rail 6. In the latter instance, the folding door could only be opened in one direction, towards the right-hand side or the left-hand side as the case may be.

The problem with which the present invention is concerned is to be seen in the fact that, when the folding door 1 is being opened, a torque must be applied to the leaves 2a and 3a of the two leaf pairs 2 and 3, with the result that the leaf 2a or 3a will be pivoted out of its closed position to buckle at the hinges 4.

In the case of the leaf pair 2 or 3 which, during the opening procedure, is grasped by the user by means of a handgrip (not depicted), the corresponding torque will be exerted by way of an appropriate pushing or pulling movement approximately perpendicular to the leaf pair 2 or 3 involved.

In the case of the present invention it is now the situation where such a torque must be able to be applied, to a certain extent automatically, to the successive leaf pair 2 or 3 in the opening direction, so that this leaf pair 2 or 3 respectively can be pivoted out of its closed position to buckle or fold-up at the hinges.

It will be understood that the same problem will likewise arise with additional leaf pairs and that, for overcoming this problem, the same type of solution will be applicable.

As may be seen especially from Figs. 2 to 4, fastened to each of the two leaves 2a and 3a of the two adjacent leaf pairs 2 and 3 in the region of the hinge, there is an entrainment means 7 and mounted on the common bearing device 5 there are two levers 8, each of which has two arms, and both two-armed levers can pivot about the axis of rotation 9 which is parallel to the hinge axis. Each arm 8a of the levers 8 on opposite sides of the axis 9 lies within the sweep zone of the free end of the entrainment means 7 and the corresponding other arm 8b of the levers extends out across the region of the leaf 2a and 3a respectively which is adjacent to the leaf 2a or 3a fitted with the entrainment means.

Figs. 3 and 4 make it especially clear that, during the opening of a leaf pair - in the illustrated example of embodiment this is the leaf pair 3 - the entrainment means 7 which is fastened to the leaf 3a, from a predetermined pivoted angle of the involved leaf 3a onwards, a torque is exerted on the associated two-armed lever 8 because of the action of the entrainment means 7 against said lever arm 8a. A corresponding force is transmitted, by way of the second lever arm 8a, to the adjacent leaf 2a where it applies a torque to this leaf 2a, thus bringing about a buckling or folding-up at the hinges of the successive leaf pair 2 and facilitating the opening movement of said successive leaf pair 2.

As opposed to this, in an analogous fashion, if the leaf pair 2 was the first to be opened manually, then the corresponding associated two armed lever 8 would be actuated by way of the entrainment means 7 attached to the leaf 2a, but in this case the lever arm 8b would act upon the adjacent leaf 3a and bring about the buckling or folding-up.

The arrangement of two entrainment means 7 and two levers 8 is necessary if the folding door - as depicted in the example of embodiment - is to be opened towards both sides.

If, as opposed to this, one of the leaf pairs 2 or 3 is mounted in a fixed position, it is only necessary to have one entrainment means 7 and one two-armed lever 8 to bring about the described buckling or folding-up of the immediately adjacent leaf pair.

It is made clear in Fig. 2 that the levers 8 are attached to a bearing device 5 configured as a hinge carrier. In this instance it concerns a known, and therefore not further described, bearing device 5 in the form of a U-shaped stirrup 10 which serves, on the one side as a hinge carrier and, on the other side, as a carrier for the runner rollers.

Because the two levers 8 are directly attached to this known bearing device 5 and, in addition, they do not project further out from the associated leaves 2a and 3a than does the bearing device 5 itself, the opening aid which has been described in the foregoing is exceptionally space-saving for the entire folding door, which is especially advantageous when the space behind this type of folding door 1 is to be utilised to the fullest possible extent, for example in the case of a cupboard.

Because the opening aid ultimately consists only of simple components, it can be simply and inexpensively manufactured.

To facilitate the transmission of the movements from the entrainment means 7 to the two-armed levers 8 on the one hand and from the lever arms 8b to the leaves 2a and 3a on the other hand, the entrainment means 7 and the lever arms 8b are fitted at their free ends with small contact rollers 11.

As a departure from the example of embodiment illustrated in Figs. 3 and 4, it is naturally conceivable that the entrainment means 7 and the two-armed levers 8 could be mounted in the centre regions of the leaves 2a and 3a, or else such types of entrainment means 7 and levers 8 could be mounted at their upper, as well as their lower, end regions.

This ultimately depends pre-dominantly upon the weight of the leaves 2a and 3b.

It can be clearly seen from Figs. 5 to 7 that, even in the case of bearing devices 5 in the form of hinge carriers with double hinges - in particular once again for heavy leaves 2a and 3b - the entrainment means 7 and the levers 8 can be disposed with saving of space between the pairs of hinges 12.

If two adjacent leaf pairs 2 and 3 are hinged onto full-length continuous rods, the levers 8 can be mounted in appropriate recesses in these rods.

The attachment of the entrainment means 7 and the levers 8 does not present any assembly problems and, in particular, it is conceivable that already existing folding doors could subsequently be fitted with such types of opening aids.

Not only the entrainment means 7, but also the levers 8, are preferably fabricated from synthetic plastics material. The same applies to the contact rollers 11.

By appropriate configuration of the levers 8 and the entrainment means 7 it can be predetermined from which opening angle onwards the desired opening aid will come into force. Likewise, with the appropriate dimensioning of the levers 8, it can be ensured that the torque exerted on the successive leaf will be sufficiently great in the sense of the desired opening aid.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A folding door having a plurality of leaf pairs, in which the leaves of each leaf pair are joined together in an articulated manner and each of two adjacent leaf pairs are hinged onto a common bearing device and at least the bearing device(s) is/are mounted to travel along at least one horizontal guide rail, characterised in that the folding door has, in the hinge region of two adjacent leaf pairs, at least on the leaf of one leaf pair, an entrainment means and, mounted on the common bearing device, a two-armed lever which can pivot around an axis of rotation parallel to the hinge axis, one arm of said lever being in the sweep zone of the entrainment means, with the other arm of the lever extending out across the region of the leaf which is adjacent to the leaf fitted with the entrainment means, so that, from a predetermined pivoted angle of the leaf fitted with the entrainment means onwards, a torque acting in the opening direction is exerted, by way of the two-armed lever, on the adjacent leaf of the folding door.

2. A folding door according to Claim 1, characterised in that, in the hinge region of two adjacent leaf pairs are provided two sets of contrarotating entrainment means and levers.

3. A folding door according to Claim 1 or 2, characterised in that the entrainment means and/or the levers are provided with contact rollers at their free ends.

4. A folding door according to any one of Claims 1 to 3, characterised in that the levers are attached to a bearing device in the form of known hinge carriers and, when viewed at right angles to the leaves, they lie within contours defined by the hinge carriers.

5. A folding door according to any one of claims 1 to 4, characterised in that the levers are attached to a bearing device in the form of known hinge carriers with double hinges and are disposed between the two double hinges.

6. A folding door according to any one of Claims 1 to 5, characterised in that entrainment means, the levers and the contact rollers are fabricated from synthetic plastics material.

7. A folding door substantially as hereinbefore described, with reference to and as illustrated in the accompanying drawings.

DATED THIS 20TH DAY OF JUNE, 1991.
PAUL HETTICH GMBH & CO.
By Its Patent Attorneys:
GRIFFITH HACK & CO.
Fellows Institute of Patent
Attorneys of Australia.

Paul Hettich Gmbh & Co., Vahrenkampstrasse 12-16,
4983 Kirchlengern

S u m m a r y

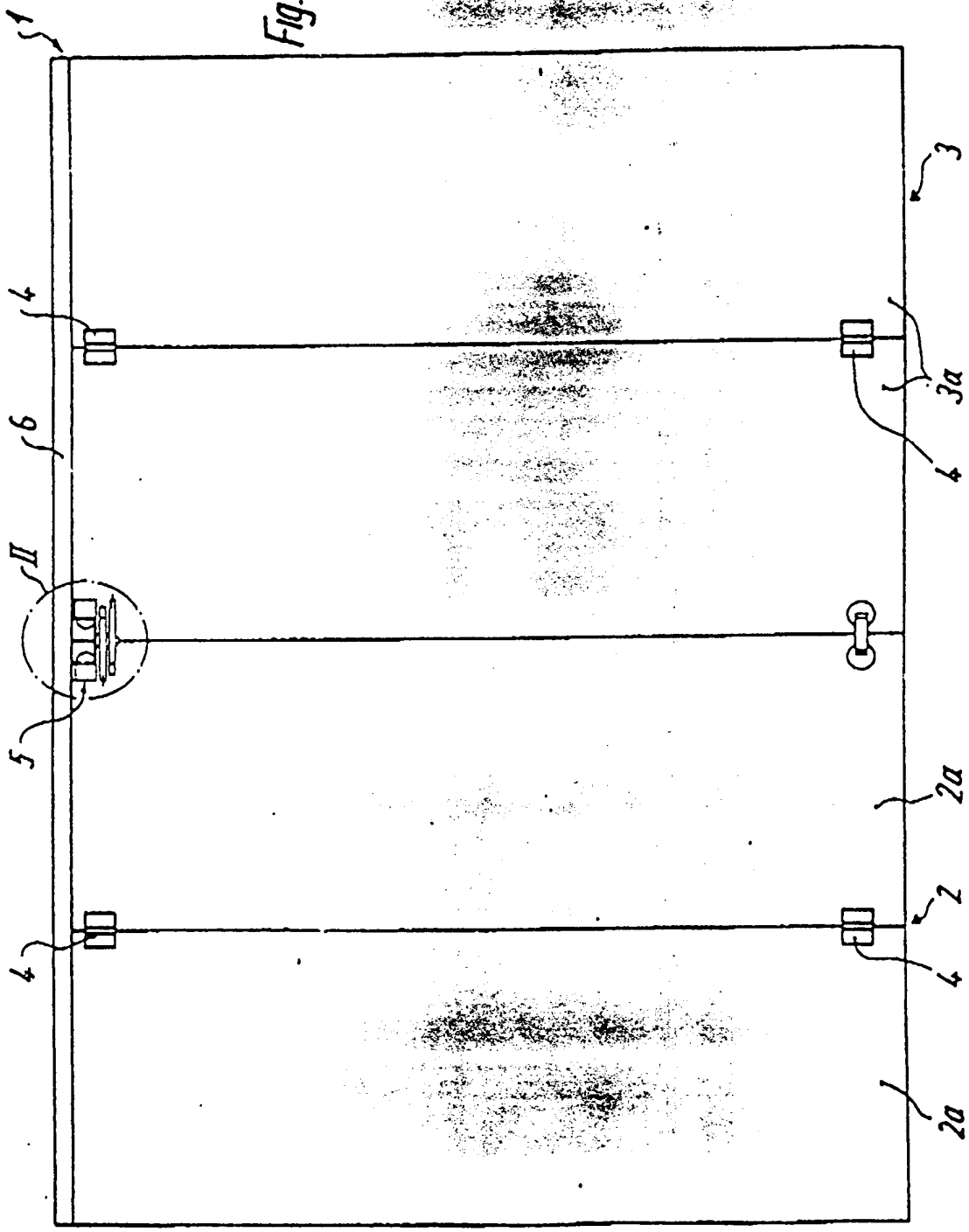
Folding door with a plurality of leaf pairs

A folding door with a plurality of leaf pairs (2, 3) is to be furnished with a simple and functional, space-saving, opening aid for the folding-up of individual leaf pairs (2, 3).

For this purpose, to the adjacent leaves (2a, 3a) of two leaf pairs (2, 3), entrainment means (7) are affixed, with one arm (8a) of a two-armed lever (8) being in the sweep zone of said entrainment means (7). The other arm (8b) of the lever (8) extends out across the region of the leaf (2a, 3a) which is adjacent to the leaf (2a, 3a) fitted with the entrainment means (7), so that, from a predetermined pivoted angle of the leaf (2a), for example, fitted with the entrainment means (7) onwards, a torque acting in the opening direction is exerted, by way of the two-armed lever (8), on the adjacent leaf (3a) of the folding door.

Fig. 3

Fig.1



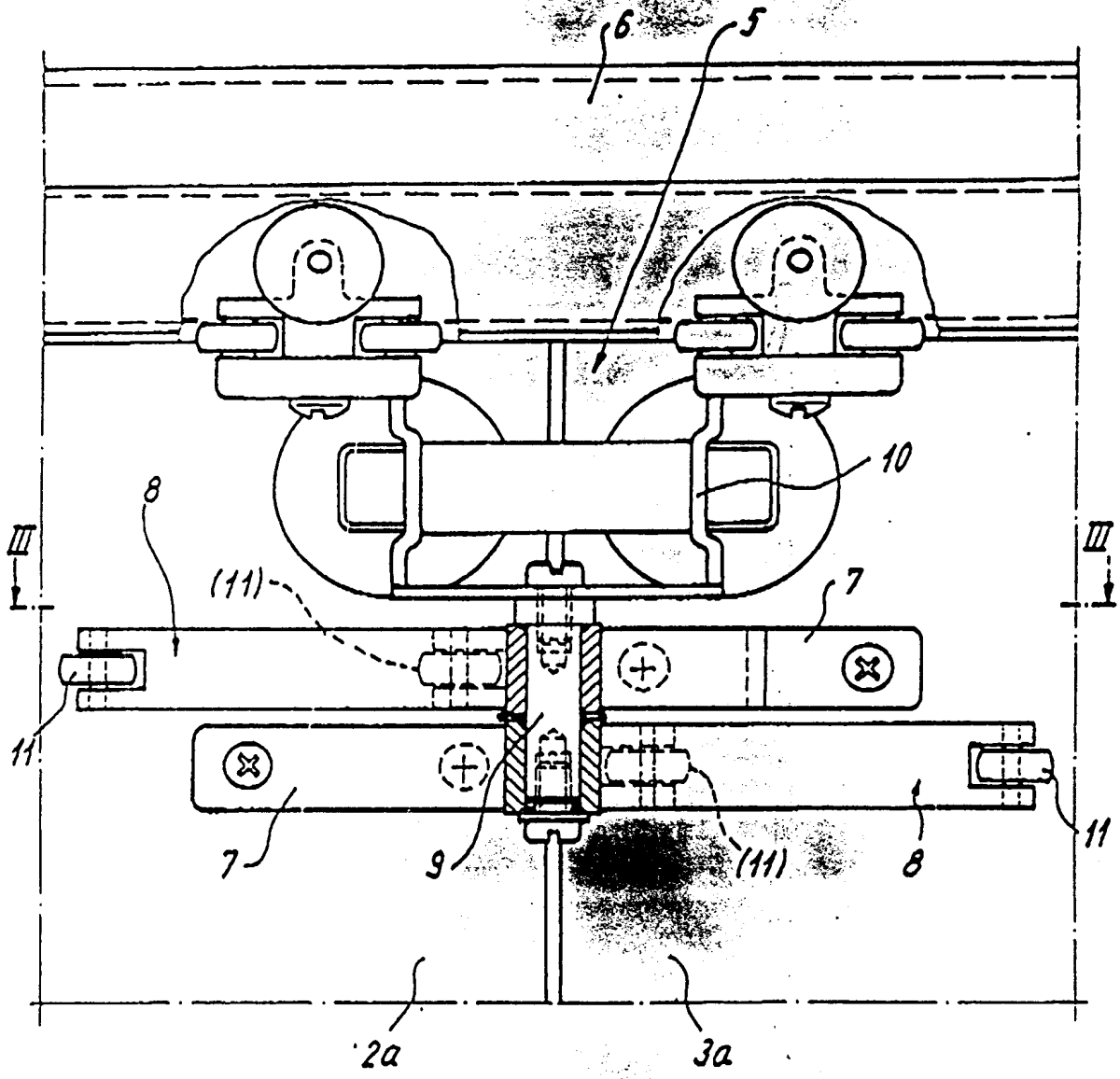


Fig. 2

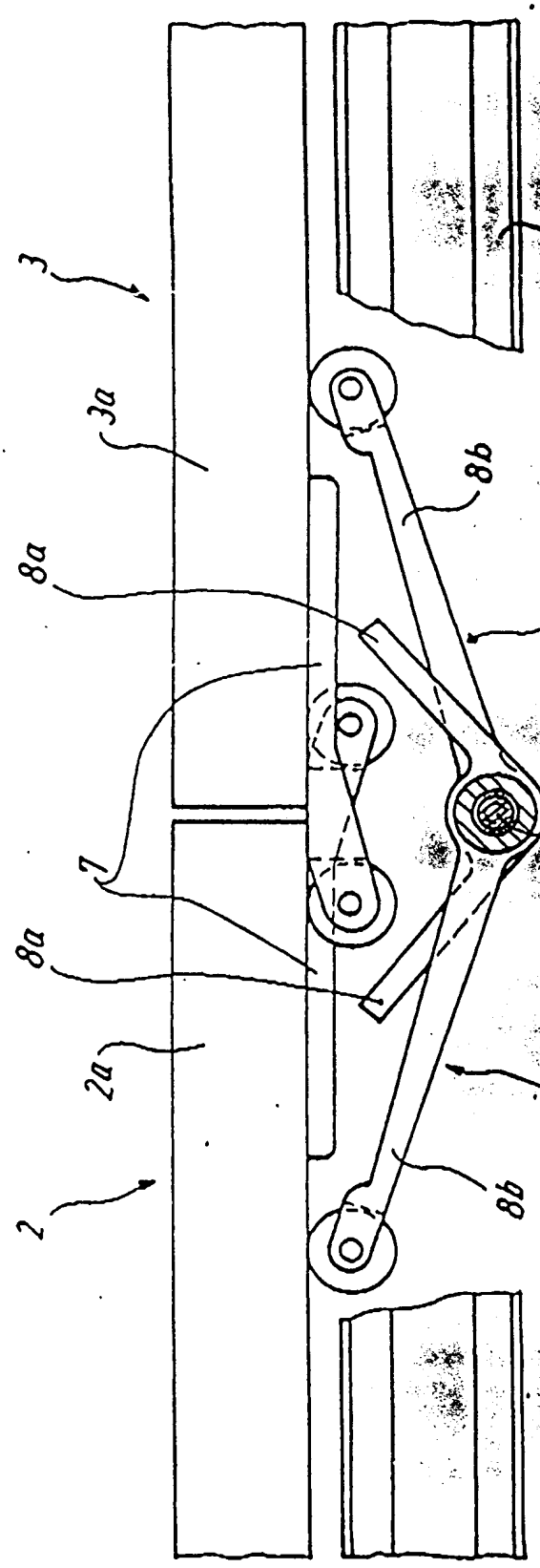
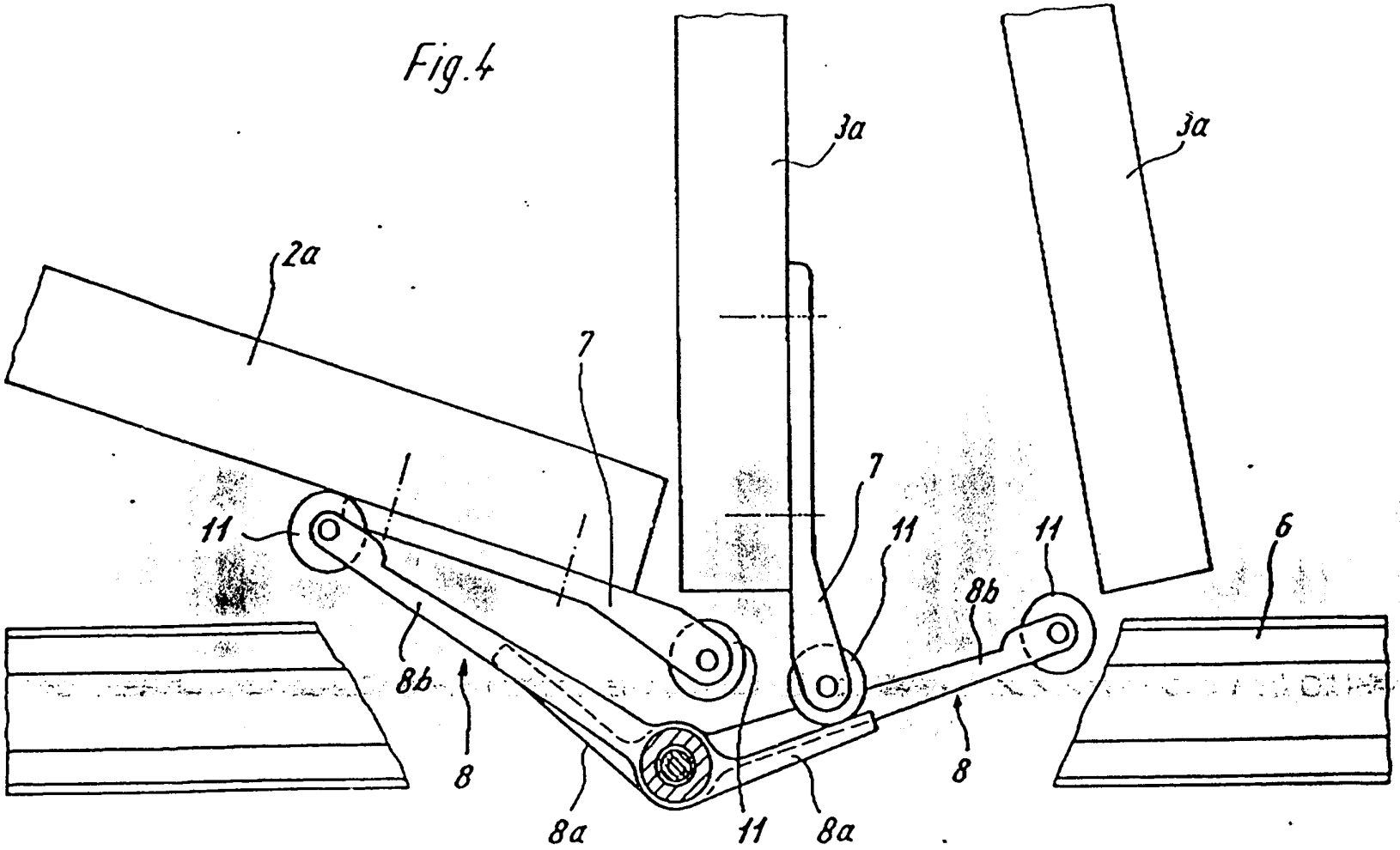


Fig. 3

Fig. 4



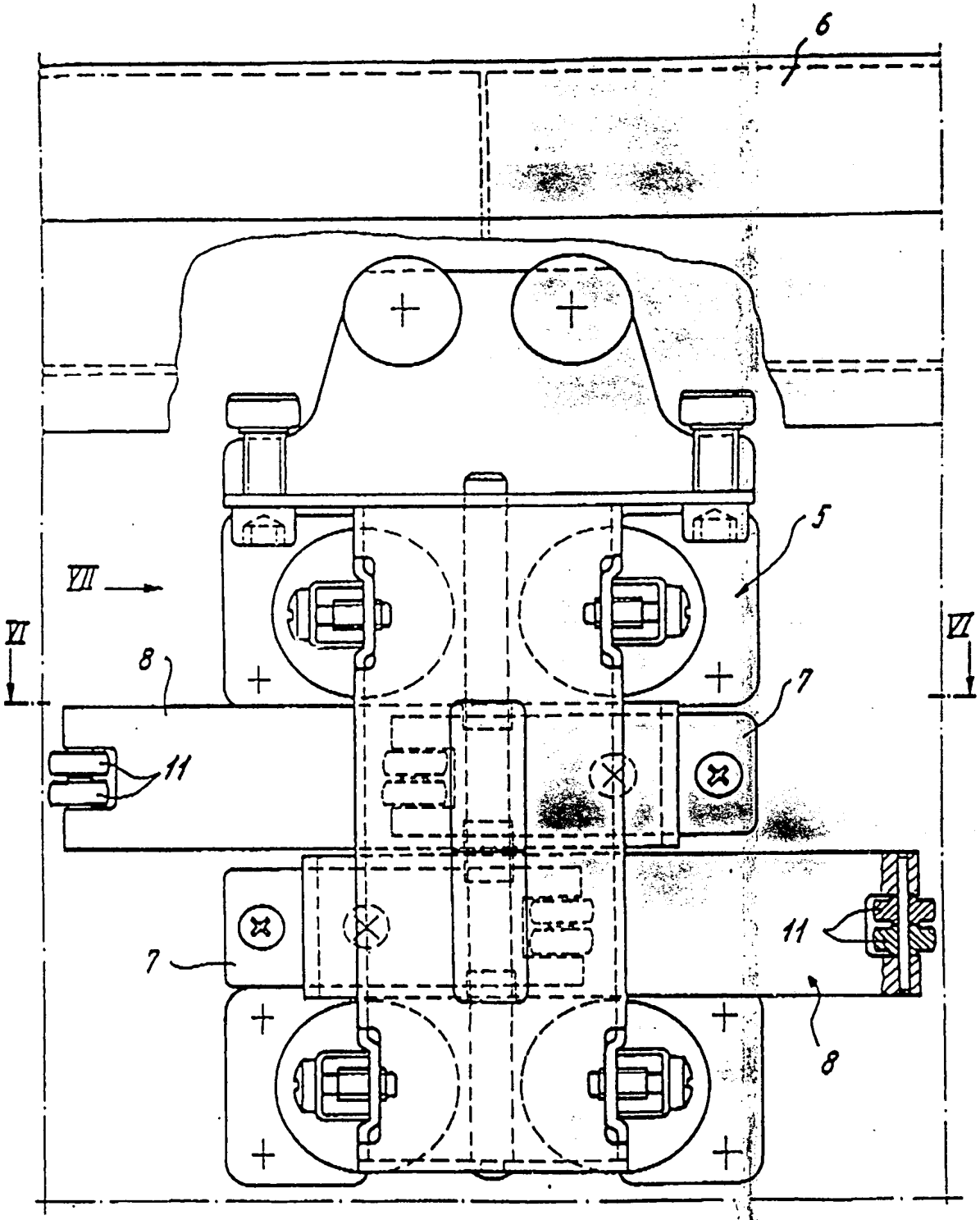
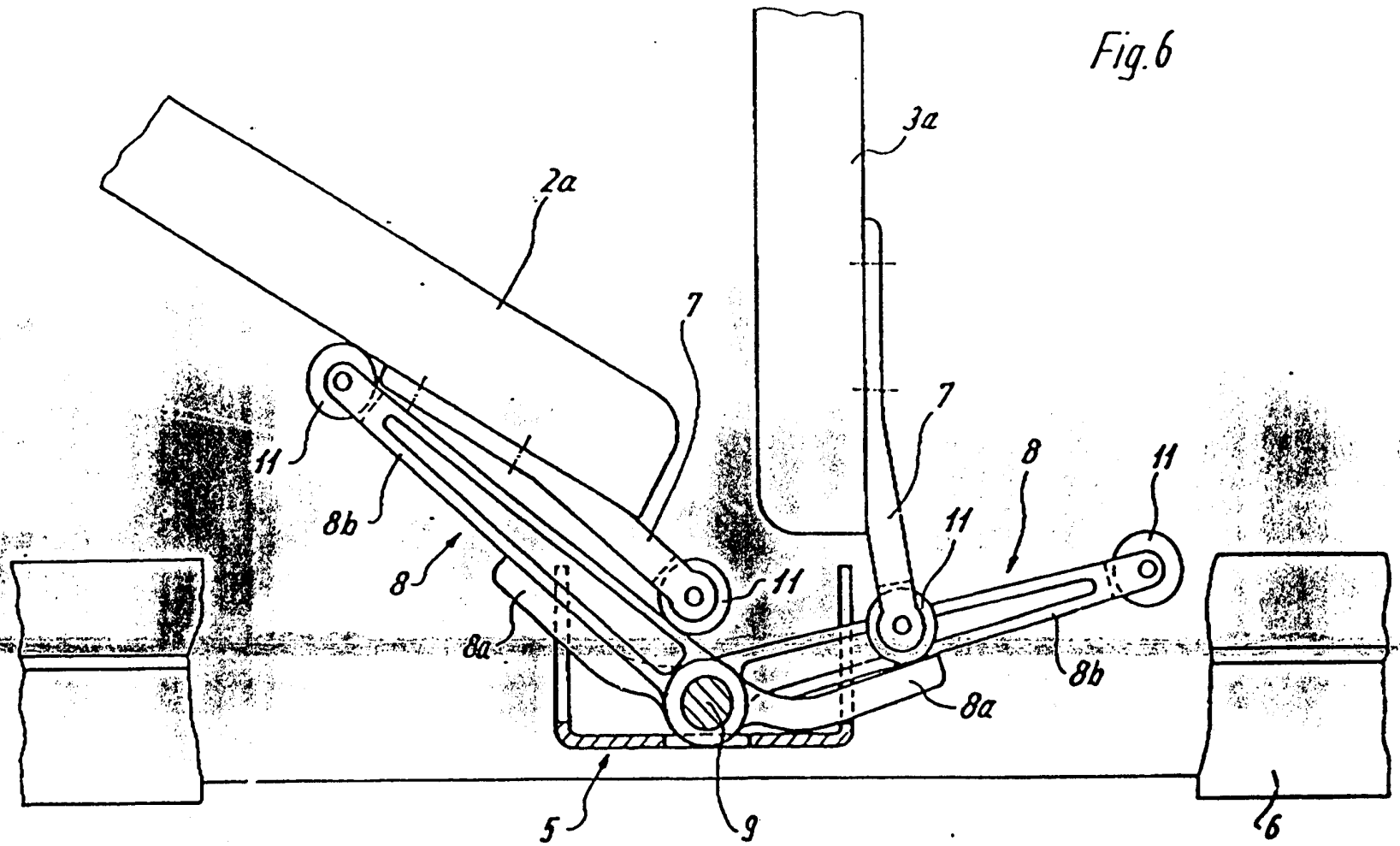


Fig. 5

Fig. 6



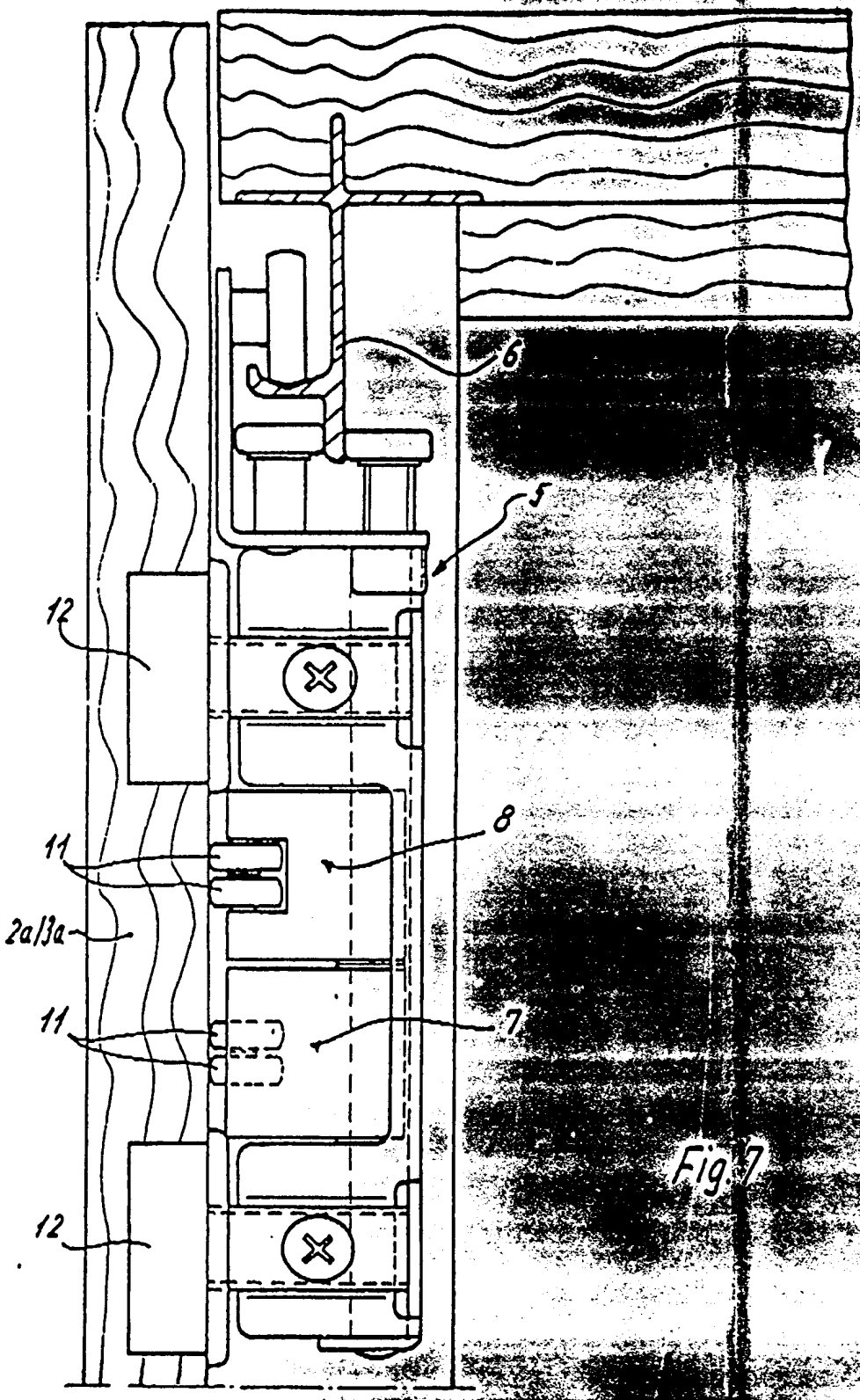


Fig. 7

INTERNATIONAL SEARCH REPORT

International Application No PCT/DE89/00385

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl.4 E06B 3/48 , E05D 15/26

II. FIELDS SEARCHED

Minimum Documentation Searched *

Classification System	Classification Symbols
Int.Cl.4	E06B , E05D

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched *

III. DOCUMENTS CONSIDERED TO BE RELEVANT *

Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages **	Relevant to Claim No. **
A	DE,A, 3507863 (HETTICH) 11 September 1986 see page 10, lines 6-28; page 12, line 3 page 13, line 14; figures 5-14	1,2,4
A	CH,A, 365860 (ATLAS KASSENFABRIK) 15 January 1963, see page 2, lines 11-81, figures 1-6	1,2,4
A	DE,A, 1759226 (BATOR) 3 June 1971 see page 3, line 1, page 5, line 4 figures 1,2	1,2,4
A	DE,U, 7827705 (NUSING) 20 December 1979	
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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
5 September 1989 (05.09.89)	2 October 1989 (02.10.89)
International Searching Authority	**Signature of Authorized Officer**
European Patent Office	

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. DE 8900385 SA 29176

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A- 3507863	11-09-86	None	
CH-A- 365860		None	
DE-A- 1759226	03-06-71	None	
DE-U- 7827705		None	
DE-A- 2506469	14-08-75	AT-B- 333477	25-11-76
		NL-A- 7501591	15-08-75

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